

CLAIMS

What is claimed is:

1. An optical pickup actuator moving an objective lens in a tracking direction, a focusing direction, and a tilting direction, the optical pickup actuator comprising:
 - a lens holder, on which the objective lens is mounted; and
 - a tilt photodetector, which is installed in the lens holder and receives a portion of light used to record information on and/or reproduce information from a recording medium according to a relative tilt between the objective lens and the recording medium, thereby detecting the relative tilt between the objective lens and the recording medium.
2. The optical pickup actuator of claim 1, wherein:
the tilt photodetector is installed at a lower portion of the objective lens.
3. The optical pickup actuator of claim 2, wherein:
the lens holder has a stepped through-hole with a stepped portion; and
the tilt photodetector is installed on the stepped portion of the stepped through-hole so that the tilt photodetector is installed at the lower portion of the objective lens.
4. The optical pickup actuator of claim 2, wherein the tilt photodetector comprises:
at least two tilt photodetectors, which are disposed in a radial direction of the recording medium, to detect a relative radial tilt between the recording medium and the objective lens; and/or
at least two tilt photodetectors, which are disposed in a tangential direction of the recording medium, to detect a relative tangential tilt between the recording medium and the objective lens.
5. The optical pickup actuator of claim 4, wherein:
the tilt photodetectors are disposed on opposing sides of the lower portion of the objective lens along the radial direction and/or the tangential direction of the recording medium, to detect a radial tilting direction and/or a tangential tilting direction.
6. The optical pickup actuator of claim 1, wherein wherein the tilt photodetector comprises:

at least two tilt photodetectors, which are disposed in a radial direction of the recording medium, to detect a relative radial tilt between the recording medium and the objective lens; and/or

at least two tilt photodetectors, which are disposed in a tangential direction of the recording medium, to detect a relative tangential tilt between the recording medium and the objective lens.

7. The optical pickup actuator of claim 6, wherein:

the tilt photodetectors are disposed on opposing sides of the lower portion of the objective lens along the radial direction and/or the tangential direction of the recording medium, to detect a radial tilting direction and a tangential tilting direction.

8. An optical pickup comprising:

a light unit that emits light to record information on and/or reproduce information from a recording medium, and detects light reflected from the recording medium so that an information signal and/or an error signal is detected;

an objective lens that focuses light emitted from the light unit and positions a light spot on a recording surface of the recording medium; and

an optical pickup actuator moving the objective lens in a tracking direction, a focusing direction, and a tilting direction and detecting a relative tilt between the objective lens and the recording medium,

wherein the optical pickup includes

a lens holder, on which the objective lens is mounted, and

a tilt photodetector, which is installed in the lens holder and receives a portion of the light according to the relative tilt between the objective lens and the recording medium.

9. The optical pickup of claim 8, wherein:

the tilt photodetector is installed at a lower portion of the objective lens.

10. The optical pickup of claim 9, wherein:

the lens holder has a stepped through-hole with a stepped portion; and

the tilt photodetector is installed on the stepped portion of the stepped through-hole so that the tilt photodetector is installed at the lower portion of the objective lens.

11. The optical pickup of claim 9, wherein the tilt photodetector comprises:
at least two tilt photodetectors, which are disposed in a radial direction of the recording
medium, to detect a relative radial tilt between the recording medium and the objective lens;
and/or

at least two tilt photodetectors, which are disposed in a tangential direction of the
recording medium, to detect a relative tangential tilt between the recording medium and the
objective lens.

12. The optical pickup of claim 11, wherein:

the tilt photodetectors are disposed on opposing sides of the lower portion of the
objective lens along the radial direction and/or the tangential direction of the recording medium,
to detect a radial tilting direction and a tangential tilting direction.

13. The optical pickup of claim 8, wherein the tilt photodetector comprises:

at least two tilt photodetectors, which are disposed in a radial direction of the recording
medium, to detect a relative radial tilt between the recording medium and the objective lens;
and/or

at least two tilt photodetectors, which are disposed in a tangential direction of the
recording medium, to detect a relative tangential tilt between the recording medium and the
objective lens.

14. The optical pickup of claim 13, wherein:

the tilt photodetectors are disposed on opposing sides of the lower portion of the
objective lens along the radial direction and the tangential direction of the recording medium, to
detect a radial tilting direction and/or a tangential tilting direction.

15. An optical pickup, comprising:

a light unit that emits light to record information on and/or read information from a
recording surface of an optical disc;

a lens that focuses the light on the recording surface; and

an actuator that uses the light reflected from the recording surface to determine a
relative tilt between the lens and the recording surface.

16. The optical pickup according to claim 15, wherein the light unit comprises:

a single light source,

wherein the light emitted is of a red wavelength suitable for a DVD.

17. The optical pickup according to claim 15, wherein the light unit comprises:
two light sources,

wherein the light emitted by one of the two light sources is of a red wavelength suitable for a DVD, and the light emitted by the remaining one of the two light sources is of an infrared wavelength suitable for a CD.

18. The optical pickup according to claim 15, wherein the actuator comprises:
a lens holder, holding the lens; and

a photodetector installed on the lens holder, that uses the light reflected from the recording surface to determine a relative tilt between the lens and the recording surface.

19. The optical pickup according to claim 18, wherein:
the photodetector is installed at a lower portion of the lens.

20. The optical pickup according to claim 19, wherein:
the lens holder has a stepped through hole with a stepped portion; and
the photodetector is installed on the stepped portion.

21. The optical pickup according to claim 18, wherein the actuator comprises:
at least two photodetectors.

22. The optical pickup according to claim 21, wherein:
the at least two photodetectors are disposed symmetrically with respect to a central optical axis of the optical pickup.

23. The optical pickup according to claim 22, wherein:
the relative tilt between the lens and the recording surface is determined by an amplitude of the light received by the at least two photodetectors; and
a direction of relative tilt between the lens and the recording surface is determined by a difference of the amplitude of the light received by each of the at least two photodetectors.

24. The optical pickup according to claim 23, wherein:

the at least two photodetectors are disposed along a first direction.

25. The optical pickup according to claim 18, wherein the actuator comprises:

a first pair of photodetectors disposed symmetrically with respect to a central optical axis of the optical pickup along a first direction;

a second pair of photodetectors disposed symmetrically with respect to the central optical axis of the optical pickup along a second direction;

the relative tilt between the lens and the recording surface is determined by an amplitude of the light received by the first and second pairs of photodetectors; and

a direction of relative tilt between the lens and the recording surface is determined by a difference of the amplitude of the light received by each photodetector of the first and second pairs of photodetectors.

26. The optical pickup according to claim 25, wherein:

the first direction and the second direction are approximately perpendicular to each other.

27. The optical pickup according to claim 15, wherein the actuator further comprises:

a magnetic circuit to move the lens and correct the relative tilt between the lens and the recording surface.

28. The optical pickup according to claim 23, wherein:

the actuator further comprises a magnetic circuit to move the lens and correct the relative tilt between the lens and the recording surface; and

the magnetic circuit comprises a triaxial movement.

29. The optical pickup according to claim 25, wherein:

the actuator further comprises a magnetic circuit to move the lens and correct the relative tilt between the lens and the recording surface; and

the magnetic circuit comprises a quadriaxial movement.

30. An optical pickup actuator to move an objective lens, comprising:

a lens holder, holding the objective lens;

a photodetector installed on the lens holder, that detects light reflected from a recording surface of an optical disc, to determine a relative tilt between the objective lens and the recording surface; and

a magnetic circuit to move the lens and correct the relative tilt between the lens and the recording surface,

wherein the light detected by the photodetector is used in writing information to and/or reading information from the recording surface.

31. An apparatus to correct a relative tilt between a lens and a recording surface, comprising:

an actuator that receives light that is used in writing information to and/or reading information from the recording surface, and is reflected from the recording surface, to determine the relative tilt between the lens and the recording surface; and

a magnetic circuit to move the lens and correct the relative tilt between the lens and the recording surface.

32. An apparatus to detect a relative tilt between a lens and a recording surface, comprising:

a lens holder, on which the lens is mounted; and

a photodetector, which is installed on the lens holder and determines the relative tilt using light used to record information on and/or reproduce information from the recording surface.

33. A method to determine a relative tilt between a lens and a recording surface, comprising:

emitting light from a light unit to write information to and/or read information from the recording surface;

focusing the light on the recording surface using the lens;

receiving the light in a photodetector after the light reflects from the recording surface; and

using an amplitude of the light received by the photodetector to determine the relative tilt between the lens and the recording surface.

34. A method to reduce a manufacturing cost of an optical pickup, comprising:

determining a relative tilt between a lens and a recording surface using a light used to record information on and/or reproduce information from the recording surface.